

4.2

Angle Measures of Triangles

Goal Find angle measures in triangles.

VOCABULARY

Corollary A corollary to a theorem is a statement that can be proved easily using the theorem.

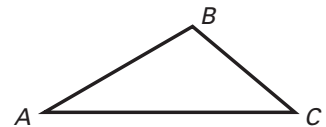
Interior angles When the sides of a triangle are extended, the three original angles are the interior angles.

Exterior angles When the sides of a triangle are extended, the angles that are adjacent to the interior angles are the exterior angles.

THEOREM 4.1: TRIANGLE SUM THEOREM

Words The sum of the measures of the angles of a triangle is 180° .

Symbols $m\angle A + m\angle B + m\angle C = 180^\circ$.



Example 1 Find an Angle Measure

Given $m\angle A = 35^\circ$ and $m\angle B = 85^\circ$, find $m\angle C$.

Solution

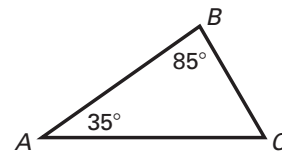
$$m\angle A + m\angle B + m\angle C = 180^\circ$$

$$35^\circ + 85^\circ + m\angle C = 180^\circ$$

$$120^\circ + m\angle C = 180^\circ$$

$$m\angle C = 60^\circ$$

Answer $\angle C$ has a measure of 60° .



Triangle Sum Theorem

Substitute for $m\angle A$ and $m\angle B$.

Simplify.

Subtract 120° from each side.

Follow-Up In Example 1, suppose a student found $m\angle C$ by calculating $180^\circ - 35^\circ - 85^\circ$.

Does this method work? Explain.

Yes; $180^\circ - 35^\circ - 85^\circ = 60^\circ$, which is $m\angle C$.

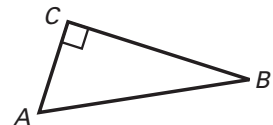
Does this method use the Triangle Sum Theorem? Explain.

Yes; $m\angle A + m\angle B + m\angle C = 180^\circ$,
so $m\angle C = 180^\circ - m\angle A - m\angle B = 180^\circ - 35^\circ - 85^\circ$.

COROLLARY TO THE TRIANGLE SUM THEOREM

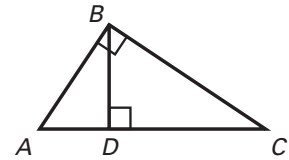
Words The acute angles of a right triangle are complementary.

Symbols In $\triangle ABC$, if $m\angle C = 90^\circ$, then $m\angle A + m\angle B = \underline{90^\circ}$.



Example 2 Find an Angle Measure

$\triangle ABC$ and $\triangle BDC$ are right triangles. Suppose $m\angle ABD = 35^\circ$. Find $m\angle DAB$.

**Solution**

$$m\angle DAB + m\angle ABD = \underline{90^\circ}$$

Corollary to the Triangle Sum Theorem.

$$m\angle DAB + \underline{35^\circ} = \underline{90^\circ}$$

Substitute for $m\angle ABD$.

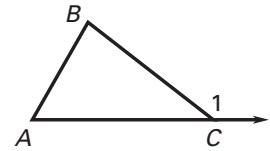
$$m\angle DAB = \underline{55^\circ}$$

Subtract $\underline{35^\circ}$ from each side.

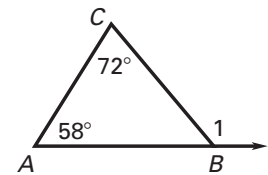
THEOREM 4.2: EXTERIOR ANGLE THEOREM

Words The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.

Symbols $m\angle 1 = m\angle A + \underline{m\angle B}$

**Example 3** Find an Angle Measure

Given $m\angle A = 58^\circ$ and $m\angle C = 72^\circ$, find $m\angle 1$.

**Solution**

$$m\angle 1 = \underline{m\angle A} + \underline{m\angle C}$$

Exterior Angle Theorem

$$m\angle 1 = \underline{58^\circ} + \underline{72^\circ}$$

Substitute.

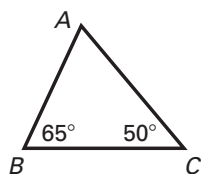
$$m\angle 1 = \underline{130^\circ}$$

Simplify.

Answer $\angle 1$ has a measure of $\underline{130^\circ}$.

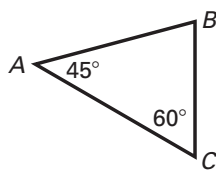
✓ **Checkpoint** Complete the following exercises.

1. Find $m\angle A$.



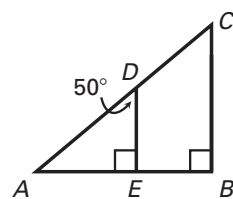
65°

2. Find $m\angle B$.



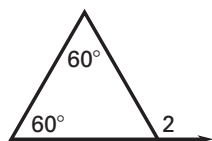
75°

3. Find $m\angle C$.



50°

4. Find $m\angle 2$.



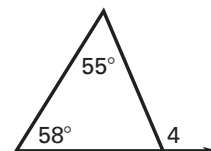
120°

5. Find $m\angle 3$.



155°

6. Find $m\angle 4$.



113°